ELSEVIER Case Report

Abdominal Aortic Pseudoaneurysm Secondary to Melioidosis

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Melioidosis is an infective condition which is common in South East Asia. It can present in various forms like cutaneous abscess, pneumonia and severe septicaemia. However, Melioidosis causing abdominal aortic pseudoaneurysms is extremely rare and a difficult condition to diagnose and treat. We present our management of two cases of abdominal aortic pseudoaneurysms secondary to Melioidosis and their subsequent outcomes. [*Asian J Surg* 2009;32(1):64–9]

Key Words: abdominal aorta, pseudoaneurysms, Meilodosis

Introduction

Melioidosis is a granulomatous infectious disease of both animals and human beings caused by *Burholderia pseudomallei* (formerly *Pseudomonas pseudomallei*), an aerobic gram negative bacillus.[1–3] The disease is endemic in areas within 20° latitude north and south of the Equator, especially South East Asia, with its primary source being found in rice paddy soil and stagnant water.[4] Transmission of the disease occurs most commonly during direct contact with soil or surface waters containing the bacterium. Less commonly, it may also be acquired via inhalation of contaminated dust particles or ingestion of contaminated water. Direct human-to-human and animal-to-human transmission is rare but can occur after contact with contaminated blood or body fluids. This disease often mimics other diseases as its clinical manifestations are diverse, ranging from localised cutaneous infections and abscesses to pneumonia and severe septicaemia.[5] However, melioidosis presenting as an aortic pseudoaneurysm is rare with only six reported cases in the literature.[4,6–10] We report two cases of mycotic abdominal aortic pseudoaneurysms secondary to melioidosis, our management, and the post-operative complications as well as their outcomes.

Case report 1

A 65-year-old Chinese gentleman with multiple comorbidities (untreated diabetes mellitus type 2, hypertension, cerebrovascular disease and childhood asthma) presented to the emergency department with left colicky flank pain of 1 week duration associated with low-grade fever and dysuria. He worked as a gardener at an island resort with exposure to soil and dust inhalation. There were no other symptoms and no reported loss of weight or appetite. At initial presentation, temperature was aurally recorded at 37.6°C. He was dehydrated and tachycardic. Left iliac fossa tenderness was elicited. The physical examination was otherwise unremarkable. His white blood cell count was elevated at 19×10^9/L with 88.5% polymorphs. Haemoglobin, serum alkaline phosphatase and amylase levels were within normal limits while prothrombin and activated partial thromboplastin times were prolonged at 23.9 and 81.9 seconds respectively. The clinical impression was that of diverticular abscess associated with sepsis. He had an urgent Computed Tomography (CT) scan of the abdomen and pelvis which showed features suggestive of a 5.5 cm pseudoaneurysm in the infra-renal abdominal aorta leaking into the left psoas muscle causing expansion and straddling (Figure 1).

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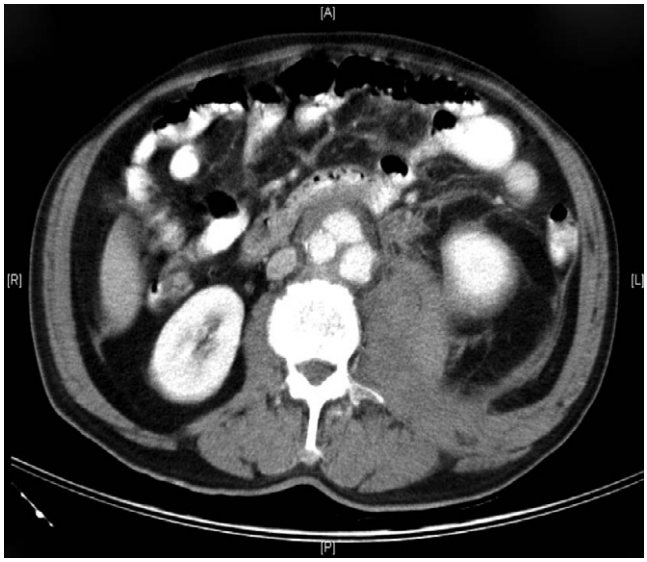

Figure 1. Leaking abdominal aortic aneurysm with a left psoas muscle haematoma (preop image).

Figure 2. Post-operative (3 months) CT scan showing a resolution of the infra-renal aortic pseudoaneurysm.

Multiple gallstones in the gallbladder were also noted. He developed hypotension after the CT scan and an emergency laparotomy was performed. Intraoperatively, an infra-renal mycotic abdominal aortic aneurysm was found with a 2 cm rupture on its left wall creating a large retroperitoneal haematoma extending to the left lateral wall and left psoas muscle. The aortic wall was friable. The bowels were noted to be viable and healthy. The aorta was ligated at the infra-renal position, in continuity, with nylon sutures and the necrotic wall was debrided. Omentum was placed in the interspace between the aneurysm that was ligated and the duodenojejunal (DJ) flexure. A cholecystectomy was performed. An extra-anatomic right axillobifemoral bypass was done using a ringed reinforced polytetrafluoroethylene (PTFE) 8-mm Impra graft.

Post-operatively, the patient was managed in the surgical intensive care unit where he continued to develop spiking fevers. The initial blood cultures did not grow any organisms. Initially, he was given an intravenous imipenem but this was subsequently changed to intravenous ceftazidime and bactrim when tissue cultures obtained intra-operatively were positive for *Burkholderia pseudomallei*. The patient developed bilateral post operative lower limb weakness which was clinically diagnosed to be spinal cord ischemia secondary to the ligated infra-renal abdominal aorta. A magnetic resonance imaging (MRI) was carried out which showed no evidence of acute cord ischemia. Degenerative changes with spondylolisthesis involving the L4 to L5 vertebrae with resultant spinal canal stenosis were however present. Other post-operative complications included a urinary tract infection and persistent hyperglycemia which was managed with intravenous insulin. He had a 6-week course of intravenous ceftazidime and a 3-month course of Bactrim and doxycycline. Through intensive rehabilitation, he attained a steady recovery. He was reviewed in 3 months and a follow-up CT scan showed a resolution of the aortic pseudoaneurysm (Figure 2). At his last review, 18 months post-operatively, he was well and Doppler ultrasound showed bilateral patency of the bypass graft with satisfactory functional recovery of the lower limb weakness.

Case report 2

A 60-year-old Chinese male, with treated type 2 diabetes mellitus and hypertension for about 6 years, presented to the hospital with a 3-week history of persistent high fever associated with chills and rigors. He had previously been treated with antibiotics by a general practitioner with no resolution of his fever. There were no other localising symptoms and there was no recent travel history. The patient was a smoker and he worked as renovation contractor involved in outdoor maintenance work. Prior to this illness he was working on an outdoor toilet renovation project with exposure to soil and dust. On admission, he was febrile with a temperature of 38.5°C. Physical examination showed a pericardial rub heard on auscultation, which was suggestive of pericarditis. His white blood cell count was elevated at 16.4×10^9/L, with 84.7% polymorphs. C-reactive protein was 167 mg/L and the erythrocyte sedimentation rate was also raised at 80 mm/hr.

The haemoglobin level was 11.8 g/dL. The chest radiography was normal and initial blood cultures showed no growth after 48 hours. A liver function test was abnormal. Alkaline Phosphatase was 847 U/L, Gamma Glutamyl Transferase was 569 U/L, Alkaline Transferase was 111 U/L, Aspartate Aminotransferase was 44 U/L and bilirubin was 11 umol/L. A hepatitis screen was negative, as were a Widal test and blood films for malaria. An ultrasound scan of the hepatobiliary system performed showed that the spleen and liver size as well as echogenicity were within normal limits. There were also no focal lesions seen. A 2D echo was done and clinical diagnosis of pericarditis was confirmed with the left ventricular ejection fraction at 64%. Ibuprofen was then administered. The patient commenced empirically on intravenous ceftriaxone and metronidazole but he continued to develop spiked fevers. The initial blood cultures did not reveal any organisms.

Repeat blood cultures however showed growth of gram negative bacteria, subsequently identified as *Burkholderia pseudomallei*. Intravenous ceftazidime doses of 2 g every 8 hours were immediately initiated. Computed tomography of the abdomen and pelvis showed mild hepatosplenomegaly and features suggestive of a pseudoaneurysm in the abdominal aorta extending from the infra-renal portion to above the bifurcation of the common iliac arteries (Figure 1). The pseudoaneurysm measured 6.1 by 4.4 by 3.8 centimetres. An emergency laparotomy was performed. Intra-operative findings were that of an infra-renal mycotic abdominal aortic pseudoaneurysm which was inflamed with thickened walls containing pus as well as an infected thrombus within the aneurysm. There was marked fibrosis surrounding the vessel and the DJ flexure was stuck down. The bifurcation of the iliac vessels was not involved and bilateral common iliac arteries were normal. The DJ flexure was taken down. An infra-renal clamp was placed and distal control of the aorta was achieved. The aorta was ligated using nylon tape and the necrotic tissue was excised and sent for culture. Omentum was placed in the interspace between the aorta and the DJ flexure. A cholecystectomy was performed. This was followed by a right axillary bifemoral bypass using a ringed reinforced PTFE 8 mm graft. Histopathological analysis of the excised aortic wall revealed mainly necrotic tissue with histological confirmation of extensive and chronic inflammation. There were foci of palisaded histiocytes but no well-formed granulomas. Cultures of the pus demonstrated growth of *Burkholderia pseudomallei*.

In the post-operative period, the patient developed pneumonia and renal impairment which resolved within days. Clinically he improved and was able to ambulate. The patient did develop an episode of sudden weakness of his right leg but CT of the brain showed no infarcts. There was no further complaint of limb weakness subsequently. After completing a 6-week course of intravenous ceftazidime, the patient recovered satisfactorily and was well on discharge. He was prescribed oral antibiotics (Bactrim, doxycycline 1,000 mg bd and Augmentin 1,250 mg bd) and was advised for further review 2 weeks later.

Unfortunately, the patient presented to the emergency department with haematemesis and melena 2 weeks later. He was anaemic and haemoglobin level was 6.3 g/dL. An urgent oesophageal-gastro-duodenoscopy was performed which revealed bleeding from the third and fourth part of the duodenum and this was highly suspicious of an aorto-enteric fistula. The patient underwent an emergency laparotomy and thoracotomy. Intra-operatively, multiple intra-abdominal abscesses were found; an interloop abscess at the terminal ileum, a large pelvic abscess and a pancreatic abscess. Dense adhesions were seen between the duodenaljejunal flexure and aortic stump. An aorto-enteric fistula was found between the ligated aortic stump and posterior wall of the duodenaljejunal flexure. There were also dense adhesions between small bowel loops, pelvis and colon. The aorto-duodenal fistula was taken down and over-sewn with prolene. The duodenum was repaired primarily and an omental patch was applied over the aorta. The patient developed cardiovascular collapse and ventricular fibrillation during the operation requiring massive transfusions of blood products and fresh frozen plasma. Post-operatively, the patient's condition remained unstable and he eventually succumbed the following day, secondary to cardiovascular collapse.

Case report 3

A 60-year-old Chinese male, with treated type 2 diabetes mellitus and hypertension for about 6 years, presented to the hospital with a 3-week history of persistent high fever associated with chills and rigors. He had previously been treated with antibiotics prescribed by a general practitioner with no resolution of his fever. There were no other localizing symptoms and there was no recent travel history. The patient was a smoker and he worked as contractor

involved in outdoor maintenance work. Prior to this illness he was working on an outdoor toilet renovation project. On admission, he was febrile and aural temperature was recorded at 38.5°C. Physical examination was suggestive of pericarditis. His white blood cell count was elevated at 16.4×10^9/L, with 84.7% polymorphs. C-reactive protein was 167 mg/L and erythrocyte sedimentation rate was also raised at 80 mm/hr. Haemoglobin level was 11.8 g/dL. Chest radiography was normal and initial blood cultures showed no growth after 48 hours. A liver function test was abnormal: alkaline phosphatase was 847 U/L, Gamma Glutamyl Transferase was 569 U/L, Alkaline Transferase was 111 U/L, Aspertate Aminotransferase was 44 U/L and bilirubin was 11 umol/L. Hepatitis screen was however negative, as were Widal test and blood films for malaria. An ultrasound scan of the hepatobiliary system performed showed that the spleen and liver size as well as echogenicity were within normal limits. There were also no focal lesions seeandn. A 2D echo was done and the clinical diagnosis of pericarditis was confirmed with the left ventricular ejection fraction at 64%. Ibuprofen was then administered. The patient was also commenced empirically on intravenous ceftriaxone and metronidazole but he continued to develop spiked fevers. The initial blood cultures did not reveal any organism.

A consult with the infectious diseases department was sought. Repeat blood cultures showed growth of gram negative bacteria, subsequently identified as *Burkholderia pseudomallei*. Intravenous ceftazidime 2 g every 8 hourly was immediately initiated. Computed tomography of the abdomen and pelvis showed mild hepatosplenomegaly and features suggestive of an aneurysm in the abdominal aorta extending from the infra-renal portion to above the bifurcation of the common iliac arteries (Figure 3). The aneurysm measured 6.1 by 4.4 by 3.8 centimetres.

An emergency laparotomy was performed. Intra-operative findings were that of an infra-renal mycotic abdominal aortic aneurysm which was inflamed with thickened walls containing pus as well as an infected thrombus within the aneurysm. There was marked fibrosis surrounding the vessel and the duodenum was stuck down. The bifurcation of the iliac vessels was not involved and bilateral common iliac arteries were normal. The superior portion of the aorta was then dissected out. An infra-renal clamp was placed and distal control of the aorta was achieved. The aorta was ligated using nylon tape and the necrotic tissue was excised and sent for culture. Omentum was patched over the aorta and separated from the duodenum and a cholecystectomy was also performed. This was followed by a right axillary bifemoral bypass using ringed PTFE 8 mm graft. After the operation, bilateral peripheral pulses could be detected on Doppler ultrasound flow-metry. Histopathological analysis of the excised aortic wall revealed mainly necrotic tissue with extensive and chronic inflammation. There were foci of palisaded histiocytes but no well-formed granulomas. Cultures of the pus demonstrated growth of *Burkholderia pseudomallei*.

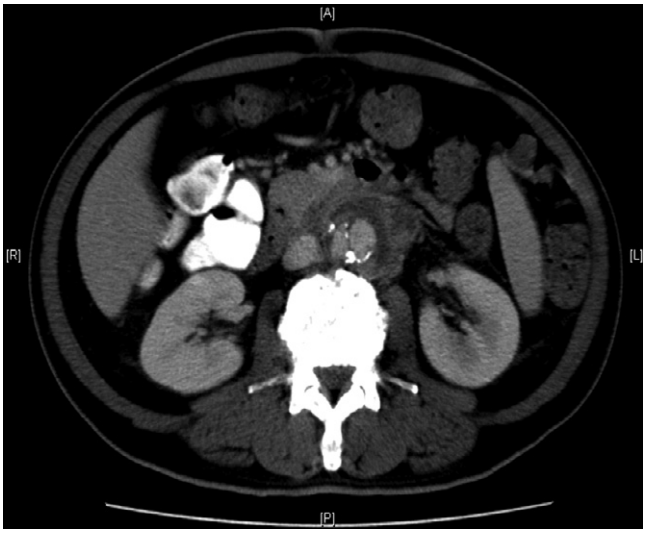

Figure 3. Pre-operative CT scan showing the infra-renal aneurysm.

During the post-operative period, the patient developed pneumonia and renal impairment which resolved within days. Clinically he improved and was able to ambulate. The patient did develop an episode of sudden weakness of his right leg but computed tomography of the brain showed no infarcts. There was no further complaint of limb weakness subsequently. After completing a 6-week course of intravenous ceftazidime, the patient recovered satisfactorily and was well on discharge. He was prescribed oral antibiotics (Bactrim, doxycycline 1,000 mg bd and Augmentin 1,250 mg bd) and was advised for further review in 2 weeks' time.

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Discussion

Melioidosis is endemic in Singapore which lies close to the Equator. The first case of Melioidosis in Singapore was reported in 1920.[3] However, it was not until 1989 that the disease was made administratively notifiable.[11] Over the last 10 years, an average of 67 cases have been reported annually, ranging from 36 to 114 cases (1994–2004).

The incidence of Melioidosis in Singapore is 1.7 per 100,000 and it most commonly affects immunocompromised individuals (such as diabetics). It is 4.5 times more common in males and usually occurs in the fourth to sixth decade of life. There is a 40% case fatality rate and an increased fatality seen in older age groups and in smokers as well as patients with concurrent medical conditions and septicaemia.[11] This is in keeping with other literature reviewed.[12–14] Our two patients were male, smokers, diabetics and had exposure to soil inhalation works prior to their illness. Therefore, we suggest that for patients with this profile who develop sepsis and abdominal pain that early CT scans of the abdomen and pelvis should be done for swift diagnosis and intervention as this may lead to decrease in morbidity and mortality.

The disease frequently masquerades as other diseases, usually presenting as localised cutaneous infections and abscesses, pneumonia, and generalised septicaemia.[4] However, involvement of the cardiovascular system resulting in mycotic aortic aneurysm is very rare. There have only been six reported cases, involving thoraco-abdominal aorta,[8–10] abdominal aorta,[7] renal artery,[9] intrathoracic subclavian artery,[4] and iliac artery.[6]

A mycotic aneurysm is defined as a localised, irreversible dilatation of an artery to at least 1.5 times its normal diameter, due to the destruction of the vessel wall by an infection. It may be a true or false aneurysm and can develop either when a new aneurysm is produced by infection of the normal arterial wall or when a pre-existing aneurysm becomes secondarily infected. The source of infection may be intrinsic (usually a complication of infective endocarditis with embolization and an arrest of a septic embolus at some point within a vessels) or extrinsic (as a result of bacteraemia or an extension of an adjacent suppurative process such as osteomyelitis and pneumonia). Bacteria such as *Salmonella*, *Staphylococcus* and *Streptococcus* account for the majority of mycotic aneurysms. Hence, the two patients underwent cholecystectomy and bile was sent for culture and sensitivity. However, other less common causative organisms may sometimes be found in the immunocompromised and intravenous drug abusers.

Melioidosis as a cause of mycotic pseudoaneurysm is very rare and diagnosis requires a combination of history findings, clinical and haematological investigations and radiological confirmation. Leukocytosis, a raised erythrocyte sedimentation rate and C-reactive protein are usually seen. Laboratory diagnosis is made by conventional culture techniques. *Burkholderia pseudomallei* grow on standard culture media to produce characteristic wrinkled colonies with umbonated centres and radiating ridges after incubation for 72 hours.[7] However, in both our cases, the initial cultures were negative. The use of Wayson, methylene blue or Wright's stain often reveals bipolar staining of the organism.[7] In recent years, various tests including serology and polymerase chain reaction tests have been developed to facilitate more rapid identification of the bacterium.[15] Imaging studies namely, CT, angiograms and MRI are useful in the diagnosis of a mycotic aneurysm.

The management of melioidosis with abdominal pseudoaneurysm is complicated and difficult. Treatment can be broadly classified into medical and surgery interventions. According to Luo et al, ceftazidime, a third generation cephalosporin, is the drug of choice in the treatment of acute melioidosis complicated with septicaemia, and co-trimoxazole is recommended for maintenance therapy thereafter.[6] Conventional surgical intervention

involves resection of the infected aneurysm with restoration of the distal blood flow with *in-situ* reconstruction or placement of an extra-anatomic bypass graft.[6]

In-situ reconstruction may be performed using one of the types of grafts, namely, arterial homograft, cryopreserved allograft and silver coated polyester graft. The role of *in-situ* graft in the repair of mycotic aneurysms secondary to melioidosis remains controversial. Lee et al reported a case of abdominal aortic pseudoaneurysm caused by melioidosis, which was successfully treated with a prosthetic graft interposition.[7] In contrast, in a separate case reported by Schindler et al, a patient who underwent an *in-situ* femoral vein graft reconstruction for a melioidosis-infected intrathoracic subclavian artery pseudoaneurysm, suffered a relapse a week after the surgery and had to undergo a second salvage operation.[4] Luo et al found that *in-situ* graft interposition yielded good results in *Salmonella* mycotic aneurysm with an overall mortality rate of 32%, of which, 50% were due to recurrent sepsis.[16] We decided to perform an extra-anatomic bypass graft in both cases. An extra-anatomic bypass graft can be performed using either a PTFE or a Dacron implant. According to Fichelle et al, cases in which extra-anatomic bypass grafts were used showed long-term patency rates of 85% and similar limb salvage rates as that of *in-situ* reconstruction.[17] Thus, he recommended that extra-anatomic bypass graft be used in the treatment of mycotic aneurysms secondary to melioidosis.

In conclusion, due to the diversity of its clinical manifestations, diagnosis of melioidosis requires high index of suspicion as initial blood cultures can be negative as shown in both these cases. The radiological investigation of choice for diagnosis is a CT scan. Considering the high virulence of this bacterium and the recurrent relapsing nature of melioidosis, we believe that it may be unwise to leave a prosthesis or allograft in such an infectious tissue bed. Although *in-situ* graft replacement of infected aneurysms is reported to be successful in most cases with *Salmonella*. The procedure of choice in the case of melioidosis mycotic pseudoaneurysm should be resection, aggressive debridement and reconstruction with an extra-anatomic bypass graft. Acute treatment of sepsis with ceftazidime for 2–6 weeks must be followed by maintenance antibiotics, which should include doxycycline (4 mg/kg/day bd) and Bactrim (10–50 mg/kg/day bd) for duration of at least 3–6 months. In addition, patients should be followed up closely for the rest of their lives in order to ensure an optimal survival rate.

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